EFFECTIVENESS OF STRETCHING AND STRENGTHENING EXERCISES IN SHOULDER IMPINGEMENT SYNDROME

DISSERTATION

Submitted to

The Tamilnadu Dr. MGR Medical University

In partial fulfillment for the degree of

MASTER OF PHYSIOTHERAPY

(Advanced P.T. in Orthopaedics)

Cherraan's College of Physiotherapy

Cherraan's Institute of Health Sciences

Coimbatore, Tamilnadu, India

APRIL- 2012

CERTIFICATE

The work embodied in the thesis entitled "**EFFECTIVENESS OF STRETCHING AND STRENGTHENING EXERCISES IN SHOULDER IMPINGEMENT SYNDROME" submitted to the The Tamilnadu Dr. MGR Medical University, Chennai** in partial fulfillment for the degree of **MASTER OF PHYSIOTHERAPY (ADVANCED P.T. IN ORTHOPAEDICS)**was carried out by candidate bearing register number **27103003** at Cherraan's College of Physiotherapy, Coimbatore under my supervision. This is an original work done by her and has not been submitted in part or full for any other degree/diploma at this or any other university/institute. The dissertation is fit to be considered for evaluation for award of the degree of Master of physiotherapy.

Signature of Supervisor	**Principal**
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Project work evaluated on _____

DECLARATION

The work embodied in the thesis entitled **"EFFECTIVENESS OF STRETCHING AND STRENGTHENING EXERCISES IN SHOULDER IMPINGEMENT SYNDROME"** submitted to **The Tamilnadu Dr. MGR Medical University, Chennai**, in partial fulfillment for the degree of Master of Physiotherapy, was the original work carried out by me and has not been submitted in part or full for any other degree/diploma at this or any other university/institute. All the ideas and references have been duly acknowledged.

_____ _____

Signature of the Supervisor **Signature of student**

Mrs.Jency Thangasheela MPT

Professor

Date: _____

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Mrs.M.SAMINA

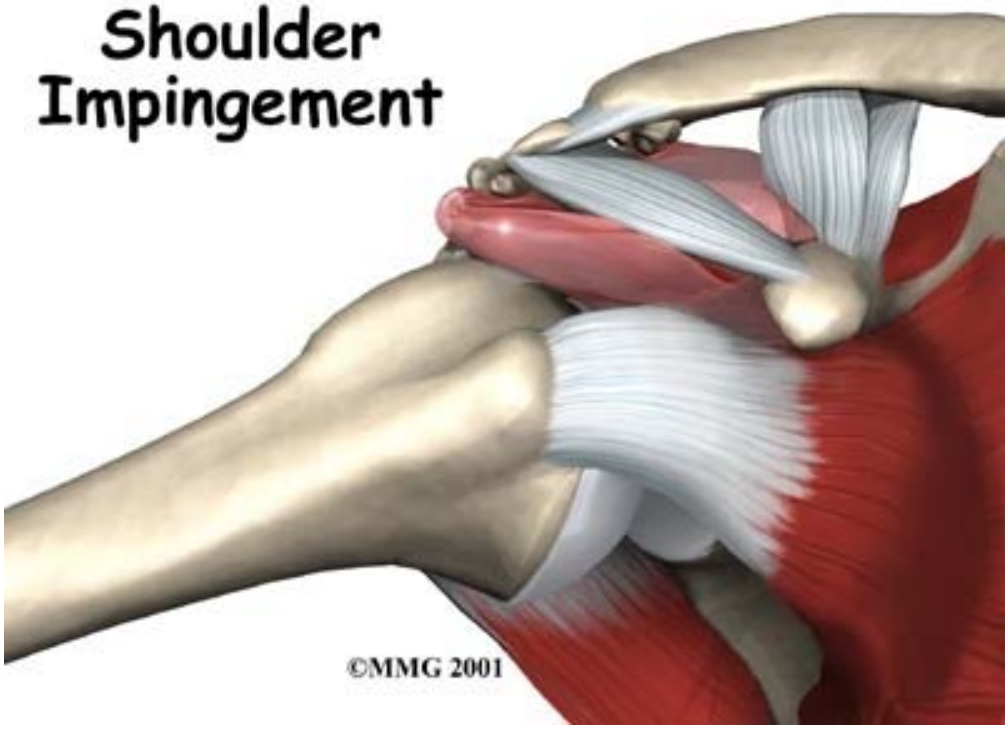
Dedicated to

My Beloved Husband

Children

And

My Parents


Shoulder
Impingement
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ABSTRACT

"EFFECTIVENESS OF STRETCHING &STRENGTHENING EXERCISES IN SHOULDER IMPINGEMENT SYNDROME"

Background: Being the most flexible joint in the human body, the shoulder is prone to injuries and dislocation that is usually very painful. Impingement syndrome occurs when the tendons of rotator cuff and the sub acromial bursa are compressed between the bones of the shoulder. Impingement syndrome is a common cause of shoulder pain especially during over head activities. Objective of this study was to find the efficacy of stretching and strengthening exercises in shoulder impingement syndrome.

Methods: Fifteen subjects are selected based on the inclusion criteria. All the subjects will be treated in single group. The duration of the study was eight weeks. Pre test and post test evaluation was done using SPADI.

Result: This study revealed significant difference in pain and functional disability after stretching and strengthening exercises.

Conclusion: The results indicate that stretching and strengthening exercises reduces pain and improves functional ability.

Key words: impingement syndrome, subacromial bursa, rotator cuff, stretching exercises, strengthening exercises.

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INTRODUCTION

Impingement syndrome also called painful arc syndrome, supraspinatus syndrome, swimmer's shoulder, and thrower's shoulder, is a clinical syndrome which occurs when the tendons of the rotator cuff muscles become irritated and inflamed as they pass through the subacromial space, the passage beneath the acromion.

Shoulder impingement occurs when certain muscles or tendons (the rotator cuff), or other soft tissue, are compressed or "pinched" between the bony structures of the shoulder joint. Inflammation and pain occurs and this is usually aggravated by shoulder and arm movements.

Impingement syndrome — Impingement syndrome is the term used to describe symptoms and signs that result from compression of the rotator cuff tendons and the subacromial bursa between the greater tubercle of the humeral head and the lateral edge of the acromion process. Patients complain of shoulder pain aggravated by reaching, pushing, pulling, lifting, positioning the arm above the shoulder level, or lying on the affected side. Most patients do not describe an injury or fall.

Shoulder pain is a common presenting complaint for patients of all ages. Shoulder impingement syndrome is the most common disorder of the shoulder. Subacromial impingement syndrome is a clinical condition that was first proposed by Neer in 1972.This syndrome is the result of chronic irritation of the supraspinatus tendon against the under surface of the anterior one third of the acromion, the coracoacromial ligament and the acromioclavicular joint. It comprises a spectrum of subacromial space lesions including partial thickness rotator cuff tears, rotator cuff tendinosis, calcified tendinitis and subacromial bursitis.

The increased forces and repetitive overhead motion can cause attritional changes in the distal part of the rotator cuff tendon, which is at risk to poor blood supply.

Jablonski's Dictionary of Syndromes and Eponymic Diseases (2nd edition) defines shoulder impingement syndrome as "Compression of the rotator cuff tendons and subacromial

bursa between the humeral head and structures that make up the coracoacromial arch and the humeral tuberosities.

Pain that is most severe when the arm is abducted in an arc between 40 and 120 degrees, sometimes associated with tears in the rotator cuff, is the chief symptom."

Need of the study:

Impingement syndrome is one of the problems of shoulder joint. Many other treatments have been found to be good for this condition. This study has been carried out to prove the importance of role of physiotherapy in the management of shoulder impingement syndrome using stretching and strengthening exercises.

Aim and Objectives of the study:

To find out the effect of stretching exercises in shoulder muscles using Hug a tree stretch, door way stretch, back of shoulder stretch etc. exercises in shoulder impingement syndrome.

To find out the effect of strengthening exercises in shoulder muscles using shoulder shrugs, towel squeezes, supine press, and biceps curls etc. in shoulder impingement syndrome.

Hypothesis

Null Hypothesis:

There was no significant effect in reduction of pain and no improvement in shoulder functional ability by using stretching and strengthening exercises in the management of shoulder impingement syndrome.

Alternate Hypothesis:

There is a significant effect in reduction of pain and improvement in shoulder functional ability by using stretching and strengthening exercises in management of shoulder impingement syndrome.

LITERATURE REVIEW

Study used randomized clinical trials that investigated physical interventions used in the rehabilitation of patients with SAIS (Sub Acromial Impingement Syndrome) with clinically relevant outcome measures of pain and quality of life. Various treatments were evaluated: exercise in six trials, joint mobilizations in two trials, laser in three trials, ultrasound in two trials, and acupuncture in two trials. The limited evidence currently available suggests that exercise and joint mobilizations are efficacious for patients with SAIS. Laser therapy appears to be of benefit only when used in isolation, not in combination with therapeutic exercise. Ultrasound is of no benefit, and acupuncture trials present equivocal evidence (**Lori Michener et al 2004).**

Eleven randomized control trials were Identified which evaluated the effect of exercise in treating impingement. Data was collected based on demographics, methodology, and outcomes of pain, range of motion, strength, and function and recorded each component in the rehabilitation programme. They concluded that exercise was effective in pain reduction and improving function, but not effective in range of motion or strength (**John Kuhn et al 2008).**

60 patients with painful disabling impingement syndrome of the shoulder were randomized, into three groups. Physiotherapy and self training was focused on strengthening the depressor muscles, centering the humeral head. Probably reduce subacromial impingement. The exercises were chosen according to clinical and electromyographic findings, identifying muscular activity during different movement. An elastic band (Thera-Band) was used for self-training at home. The advantage of thera-band is it is available in different level of resistance so it can be adjusted as per the patient's strength. No therapeutic effect was expected (**Almekinders et al 2001).**

Sixteen studies with different diagnostic criteria for shoulder impingement syndrome were included, found exercise and surgery were equally effective treatments for shoulder impingement syndrome in the long term; also home-based exercises were as effective as combined physiotherapy interventions. Some evidence found that passive treatments are not effective and cannot be justified, so passive treatments cannot be recommended for shoulder impingement

syndrome. Adding manual therapy to exercise programmes may have an additional benefit on pain at 3 weeks follow-up (**Kromer, et al 2009).**

Eight subjects with shoulder impingement were evaluated weekly during the nine weeks of single-subject design study. The study was divided into three phases (A1-B-A2) and involved repeated measures of shoulder pain and function (Shoulder Pain and Disability Index (SPADI) questionnaire), each subject participated in 12 exercise sessions supervised by a physiotherapist. All subjects showed significant improvement in the SPADI at the end of the study. The present results provide preliminary evidence to support the use of shoulder control exercises to reduce pain and improve function of persons with shoulder impingement (**Jean-Se'bastien Roy, et al 2008).**

Thirty patients diagnosed with outlet impingement syndrome of the shoulder were divided into two groups. Group 1 was instructed with the active range of motion (ROM), stretching and strengthening exercise program with an elastic band at home at least seven times a week for 10–15 min and Group 2 received a prescription for 12 sessions of joint and soft tissue mobilization techniques, ice application, stretching and strengthening exercise programs and patient education in clinic for three times per week. Subjects in both groups experienced significant decreases in pain and increases in shoulder function, but there was significantly more improvement in the manual therapy group compared to the exercise group (**Gamze Senbursa et al 2005)**.

Nine patients (five females and four males, mean age 54 years) with a long duration of shoulder pain diagnosed as having shoulder impingement syndrome and on the waiting list for surgical treatment were observed and studied, the effects of a specially designed painful eccentric training programme for the supraspintus and deltoideus muscles (3×15 reps, 2 times/day, 7 days/week, for 12 weeks). The patients evaluated the amount of shoulder pain during horizontal shoulder activity on a visual analogue scale (VAS), and satisfaction with treatment. Constant score was assessed. After 12 weeks of treatment, five patients were satisfied with treatment. Their mean VAS had decreased (62–18, $P<0.05$), and their mean Constant score had increased (65–80, $P<0.05$) (**Per Jonsson et al)**

60 patients diagnosed with shoulder impingement syndrome were selected and randomly distributed into experimental and control groups. Patients were evaluated regarding pain, function, quality of life, muscle strength, and the number of anti-inflammatory drugs and analgesics taken. Patients then participated in the progressive resistance training program for the musculature of the shoulder, which was held twice a week for 2 months, while the control group remained on a waiting list. Patients from the experimental group showed an improvement from 4.2 cm to 2.4 cm on a 10-cm visual analog scale (**Império Lombardi, et al 2008)**.

Fifty-nine patients were selected with impingement syndrome; Subjects were given a progressive exercise program that included resistive strengthening, stretching, and postural exercises that were done daily at home. Pretest and posttest scores were compared using paired *t* tests and repeated-measures analysis of variance. At 6-month follow-up, improvements made in pain, satisfaction, and function were maintained (**Philip McClure ,et al 2004)**.

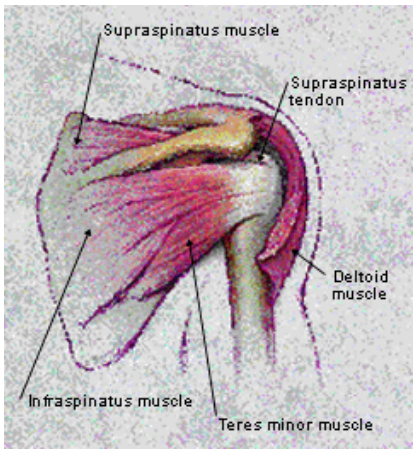
Sixty patients with the diagnosis of an outlet impingement syndrome of the shoulder (Neer I and II) were treated either by strengthening the depressors of the humeral head with a guided self-training program, by conventional physiotherapy, or by wearing a functional brace. The Constant-Murley score was assessed after 6 and 12 weeks. Shoulder pain was monitored with a visual analog scale. All three groups showed a significant improvement in shoulder function as well as a significant reduction in pain. There were no statistically significant differences among the groups. Guided self-training can lead to results similar to those of conventional physiotherapy. The comparable effect of the functional brace remains unclear and might be explained by an influence on proprioception (**Markus Walther, et al 2004)**.

A study was conducted to prove characteristics of SPADI scale useful both in clinical and research purpose. So for this study thirty seven male patients with complain of shoulder pain were considered. Test –retest reliability of SPADI total score ranged from 0.6377to 0.6552.Internal consistency ranges were from 0.8604 to 0.9507.Regarding Range Of Motion SPADI total and subscale scores were highly negatively correlated. The SPADI scores and changes in shoulder Range Of Motion showed high negative correlation changes. so the SPADI proved to be useful (**Kathry Roach et al Nov 2005).**

Anatomy

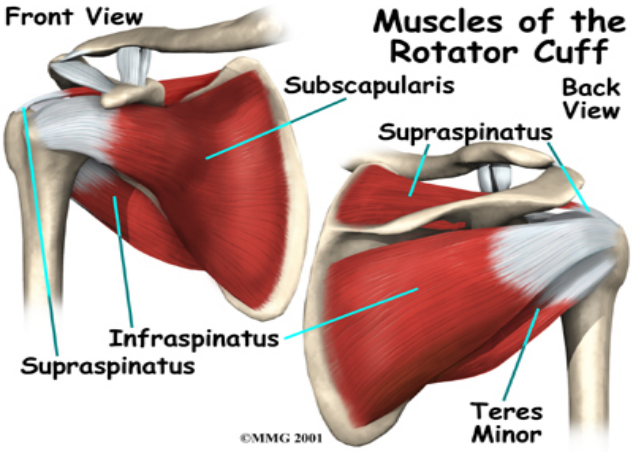
The rotator cuff comprises four muscles--the subscapularis, the supraspinatus, the infraspinatus and the teres minor--and their musculotendinous attachments. The subscapularis muscle is innervated by the subscapular nerve and originates on the scapula. It inserts on the lesser tuberosity of the humerus. The supraspinatus and infraspinatus are both innervated by the suprascapular nerve, originate in the scapula and insert on the greater tuberosity. The teres minor is innervated by the axillary nerve, originates on the scapula and inserts on the greater tuberosity. The subacromial space lies underneath the acromion, the coracoid process, the acromioclavicular joint and the coracoacromial ligament. A bursa in the subacromial space provides lubrication for the rotator cuff (*Figure 1*).

(**Allen Fongemie et al 1998)**



Anatomy of the shoulder and rotator cuff, showing (*left*)

Anterior and (*right*) posterior view.



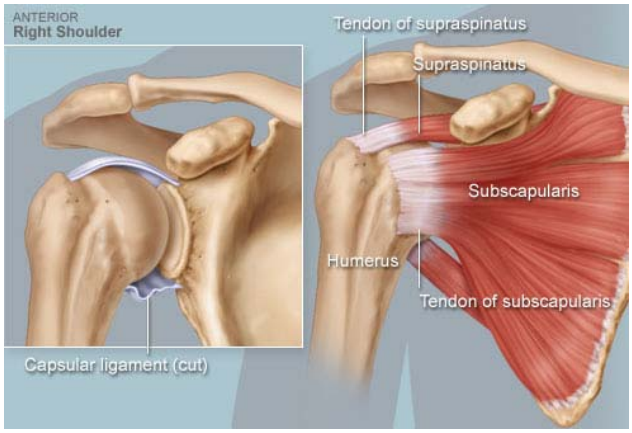


FIGURE 1

Impingement Syndrome can be classified as External or Internal:

1. External impingement, which can be either primary or secondary:

Primary

- Is usually due to bony abnormalities in the shape of the acromial arch.
- Can sometimes be due to congenital abnormalities (known as os acromial), or due to degenerative changes, where small spurs of bone grow out from the arch with age, and impinge on the tendons.

Secondary

- Usually due to poor scapular (shoulder blade) stabilisation which alters the physical position of the acromion, hence causing impingement on the tendons.
- Is often due to weak serratus anterior and tight pectoralis minor muscles.
- Other causes can include weakening of the rotator cuff tendons due to overuse (e.g. throwing and swimming) or muscular imbalance with the deltoid muscle and rotator cuff muscles.

2. Internal impingement

- Occurs predominantly in athletes where throwing is the main part of the sport (e.g. pitches in baseball)
- The underside of the rotator cuff tendons are impinged against the glenoid labrum – this tends to cause pain at the back of the shoulder joint as well as sometimes at the front.

Several classification systems are used with the impingement syndrome. Neer divided impingement syndrome into three stages. Stage I involves edema and/or hemorrhage. This stage generally occurs in patients less than 25 years of age and is frequently associated with an overuse injury. Generally, at this stage the syndrome is reversible. Stage II is more advanced and tends to occur in patients 25 to 40 years of age. The pathologic changes that are now evident show fibrosis as well as irreversible tendon changes. Stage III generally occurs in patients over 50

years of age and frequently involves a tendon rupture or tear. Stage III is largely a process of attrition and the culmination of fibrosis and tendinosis that have been present for many years.

(Extracted from the Article Sports injury clinic)

Causes

- Acute trauma: a fall or severe blow to the shoulder or a single heavy lift that strains the soft tissues of the joint.
- Chronic strains
- Repeated overhead work
- Repeated sports movements (weight lifting or throwing)
- Prolonged static arm positions (computer work)
- Sleeping habits: lying on the same arm each night most of the chronic causes are related to postural habits creating muscle imbalance of the shoulder joint. Some of the muscles get tight and shortened while others get weak and overstretched. This may produce pain and stiffness in the shoulder.

Pathogenesis of rotator cuff dysfunction

There is a consensus that the causes of rotator cuff failure may reside in the tendon itself (intrinsic causes) or may reside in the structures surrounding the cuff (extrinsic causes).

Intrinsic causes

Degenerative cuff failure this constitutes the commonest cause of cuff failure and usually occurs in the older individual.[2] Degeneration of the cuff may later result in partial tears which may progress to complete tears. The precise cause of degenerative cuff tear is unknown. One possible theory relates to the 'critical vascular zone' of the cuff tendon where the blood supply is precarious, and relative ischaemia leads to degenerative changes.

Traumatic cuff failure

This may occur when the upper limb is subject to a violent force and the rotator cuff sustains a traumatic tear. In the younger individual where the tendinous part of the cuff-bone complex is stronger than the bony part, the tendons may avulse with a piece of bone.

Reactive cuff failure

Calcific rotator cuff tendinitis is an example of reactive cuff failure. The calcifying mass inside the tendon may give rise to a swelling which leads to impingement under the subacromial arch, hence resulting in cuff failure.

Extrinsic causes

Bony factor - Bigliani classified the acromion into three categories. Type III acromion is where the edge of the acromion is hooked and therefore may impinge on the rotator cuff on elevation of the arm. Osteophyte under the acromioclavicular joint reduces the subacromial space and can also lead to cuff impingement and therefore failure.

Soft tissue factors

Examples include subacromial bursitis and thickened coracoacromial ligament which can both lead to impingement of the cuff and subsequent cuff failure.

(Chan KM, Extracted from ISAKOS 2011)

Clinical Features

The most common symptoms in impingement syndrome are pain, weakness and a loss of movement at the affected shoulder. The pain is often worsened by shoulder overhead movement and may occur at night, especially if the patient is lying on the affected shoulder. The onset of the pain may be acute if it is due to an injury or may be insidious if it is due to a gradual process such as an osteoarthritic spur. Other symptoms can include a grinding or popping sensation during movement of the shoulder. The range of motion at the shoulder may be limited by pain. A

painful arc of movement may be present during the forward elevation of the arm from 60° to 120°. Passive movement at the shoulder will appear painful when a downwards force is applied at the acromion but the pain will ease once the downwards force is removed.
(Fongemie February 1998).

Special tests

All tests performed should compare both shoulders either to detect bilateral pathology or to establish a control for comparison with the affected shoulder.

Neer's Sign

- The examiner will position the arm with the thumb facing down at 45 degree angle to the body.
- Examiner will lift the patients arm above his / her head
- If patient experience pain or discomfort patient may have positive impingement of supraspinatus.

Empty Can Test

Steps:

- Patient stands with both shoulders abducted to 90°
- horizontally adducted 30°
- and internally rotated so the patient's thumbs face the floor
- examiner resists the patient's attempts to actively abduct both shoulders

Positive Test:

Weakness and/or report of pain

Positive Test Implications:

Involvement of the supraspinatus muscle and/or tendon

Yergason Test

Steps:

- Patient is sitting or standing with the elbow flexed to 90° and forearm positioned so that the lateral border of the radius faces upward (neutral position)
- Examiner stands on the involved side and places one hand on the patient's forearm and the other near the bicipital groove
- Examiner resists the patient's attempt to actively supinate the forearm and externally rotate the humerus

Positive Test:

Pain and/or snapping in the bicipital groove

Positive Test Implications:

Bicipital tendinitis or tear/laxity of the transverse humeral ligament

Speed's Test

Steps:

- Patient is sitting or standing with shoulder flexed to 90°, the elbow fully extended and the forearm supinated
- Examiner places one hand on the patient's forearm and the other hand over the bicipital groove
- Examiner resists the patient's attempt to actively flex the humerus forward

Positive Test:

Tenderness and/or pain in the bicipital groove

Positive Test Implications:

Bicipital tendinitis

Ludington's Sign Test

Steps

- Patient sits or stands with fingers interlocked on the superior/posterior aspect of the head
- Examiner stands behind the patient and bilaterally palpates the long head of the biceps
- Patient contracts biceps brachi by applying force to the top of the head
- Examiner notes any tension within the biceps tendon

Positive Test

Decreased or no tension is felt under the involved tendon; pain is increased

Positive Test Implications

Rupture of the long head of the biceps brachi tendon

Drop Arm Test

Steps

- Patient is sitting or standing with the involved arm fully abducted
- Patient then slowly lowers the arm back to their side

Positive Test

Patient is unable to slowly return the arm to the side and/or has significant pain when attempting to perform the task

Positive Test Implications

Rotator cuff pathology

Hawkins–Kennedy Impingement Test

Steps

- Patient is sitting or standing with upper extremities relaxed
- Examiner grasps the patient's elbow with one hand and the patient's wrist with the other hand
- Examiner forward flexes the shoulder to 90 degrees° and then internally rotates the patient's shoulder

Positive Test

Pain and apprehension during the motion

Positive Test Implications

Possible shoulder impingement of the supraspinatus or long head of the biceps brachii tendon

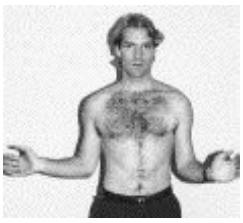
(Minnesota State University Mankato Article)

Range of motion	Impingement signs	Strength
		
1. Forward elevation (maximum arm-trunk angle)	6. Impingement I (passive forward elevation in slight internal rotation)	10. Forward flexion

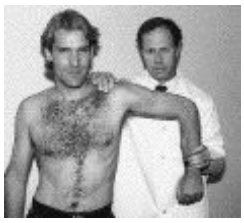
2. Abduction (note classic painful arc)

7. Impingement II (passive abduction 90 degree external rotation)

11. External rotation (arm comfortably at side--teres minor/infraspinatus)



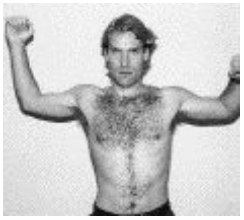
3. External rotation (arm comfortably at side)



8. Impingement III (passive abduction 90 degree internal rotation)

12. Internal rotation (arm comfortably at side--subscapularis)

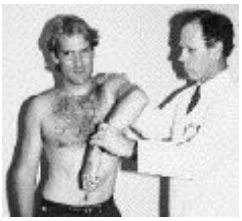
Range of motion



4. External rotation (arm at 90 degree abduction)

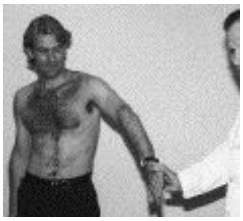
5. Internal rotation (highest posterior anatomy reached with thumb)

Impingement sign



9. Impingement IV (passive adduction: crossover)

Strength



13. Abduction--supraspinatus

FIGURE 2 - Illustrations showing elements of a shoulder assessment

(Allen Fongemie Feb 1998).

Radiological Test

Plain radiographs can be useful in depicting anatomic variants or calcific deposits. They are specifically useful in ruling out calcific tendonitis and predisposing factors such as type III acromions or acromioclavicular joint arthritis. The three recommended views are the anteroposterior view with the arm at 30 degrees external rotation, the outlet Y view and the axillary view.

FIGURE 3

(Left) normal outlet view x-ray, (Right) abnormal outlet views showing a large bone spur causing impingement on the rotator cuff.

(Extracted from the Article American Academy of Orthopaedic surgeons)

Ultrasonography and arthrography have been used when rotator cuff tears are suspected. Magnetic resonance imaging, although expensive, provides the best imaging mode for rotator cuff pathology but, ultimately, arthroscopy is the best diagnostic modality.

MRI

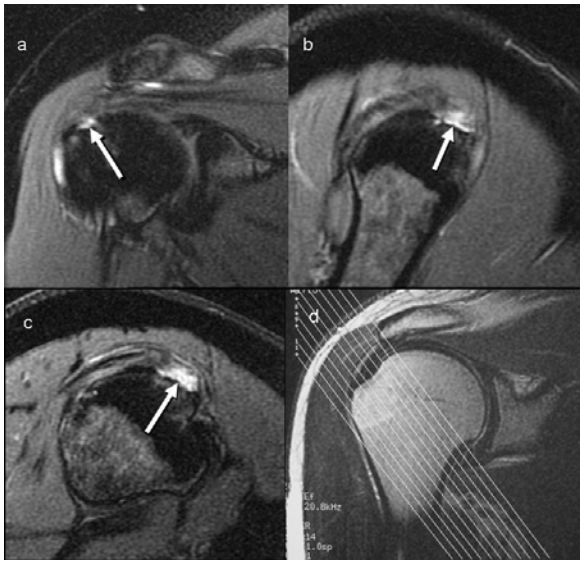


FIGURE 4

Partial-thickness tear seen better on angled oblique sagittal views.

(Extracted from http//emedicine.com.Michael John May 2011)

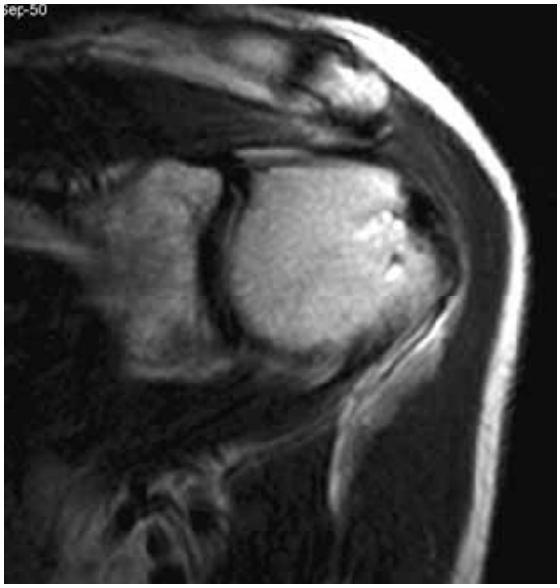


FIGURE 5

Subacromial spur with impingement on the musculotendinous junction of the supraspinatus tendon.

(Vanhoenacker 2007)

ARTHROGRAM

FIGURE 6

Left shoulder arthrogram taken with Kalare system.

FIGURE 7

Shoulder arthrography approach, oblique AP.

(Extracted from http//medical.toshiba.com)

ARTHROSCOPY

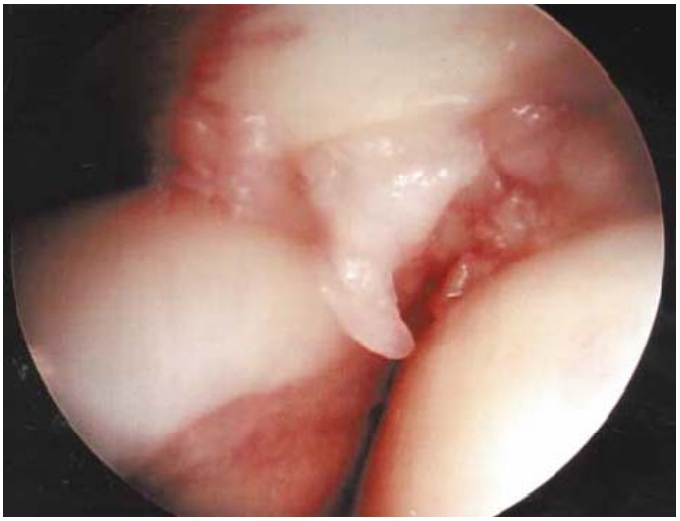


FIGURE 8 view with the arm forward flexed and internally rotated, Anterior internal impingement of the partial cuff tear against the superior glenoid is evident.

(Department of Orthopaedic Surgery Steven Struhl, 2002 Arthroscopy association of North America)

METHODOLOGY

Study Design:

Single Group Pre-test, Post-test design

Study set-up:

Cherraan's College of Physiotherapy out patient department and clinical set-up.

Sample size:

15 Subjects with a history and examination results of unilateral shoulder impingement syndrome for more than six weeks duration.

Sampling Technique:

15 subjects with clinical diagnosis of shoulder impingement syndrome are selected by simple random method.

Duration of the Study: Eight weeks

Criteria for sample selection:

Inclusion Criteria

- Both male and female patients will be included
- Age group between 25 - 60 years
- Internal impingement syndrome patients
- Patient with unilateral shoulder pain over six weeks duration
- Patient included testing positive for Neer's sign, Empty can test, Hawkins-Kennedy test, Drop arm test, Speed's test

Exclusion Criteria

- Cervical Spine involvement (Klippel Feil Syndrome)
- Glenohumeral joint adhesive capsulitis

- Frozen shoulder (Diabetes)
- History of previous shoulder surgery
- History of previous spinal surgery
- History of spinal or upper limb fractures
- Patient undergoing Physiotherapy treatment for this disorder in past 4 weeks
- Taken steroid injection into or around shoulder joint in past 6 weeks
- Poor or fragile skin condition
- Pregnancy

Materials used:

- SPADI Scale (Shoulder Pain And Disability Index)
- Empty Can
- 2kg dumbbell

Procedure

The study was done to find out the effectiveness of stretching and strengthening exercises in shoulder impingement syndrome the patient was informed in detail about the procedure and techniques which are going to be administered in the following sessions for duration of eight weeks program.

The patients were made to sit in the treatment room at the room temperature, patients were asked to keep their body and mind relaxed before the commencement of treatment. The patient is asked to report immediately if any inconvenience felt during the treatment.

The patients were given warm up exercises before starting the stretching and strengthening exercises.

The patients were explained about the pre and post test forms. The questions were asked to the patients as per the questionnaire using SPADI form. All the subjects were given stretching and strengthening exercises for duration of 30 minutes per session with 10 repetitions per session for 5 days in a week, total treatment duration is eight weeks. Informed Consent was obtained

from the patients. The study was approved by Institutional Ethical Committee of Cherraan's college of Physiotherapy.

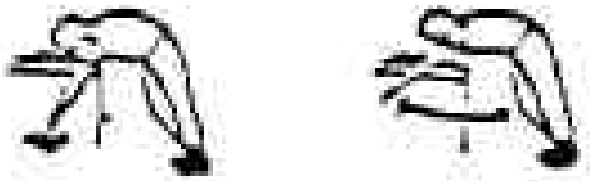
Pre test –

15 subjects with history of shoulder impingement syndrome both male and female between 25 – 60 years are included. Pain and functional disability measured using SPADI.

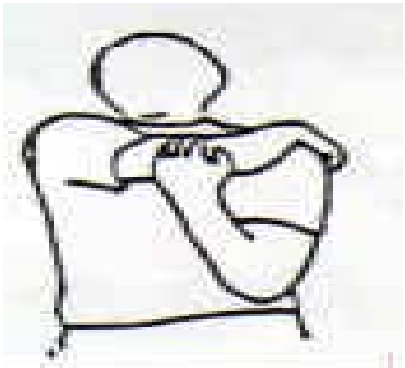
All the subjects were given stretching and strengthening exercises for duration of 30 minutes per session with 10 repetitions per session for 5 days in a week, total treatment duration is eight weeks.

STRENGTHENING EXERCISES (Range of Motion)

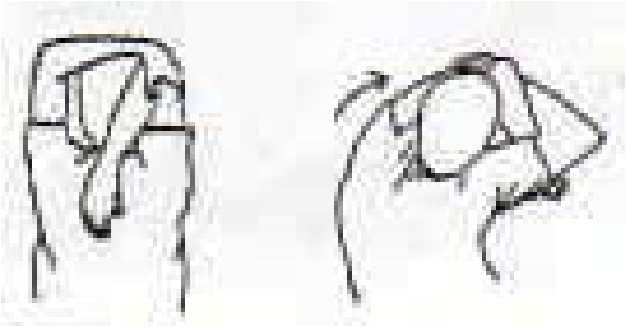
Codman's Pendulum Swings: Lean over table, supporting body with uninvolved arm. Let involved arm hang straight down in a relaxed position. Gently swing arm in circles clockwise and counterclockwise; then in a pendulum motion forward backward and side-to-side. Repeat 30 times in each direction.



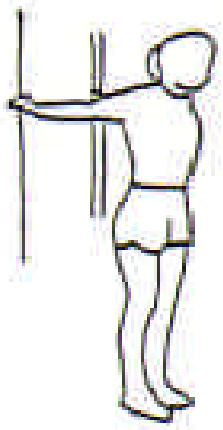
Horizontal Adduction Stretch: Grasp elbow of involved arm with opposite hand and gently pull involved arm across front of chest just below chin. Hold 5 - 7 seconds and relax. Repeat 5 - 10 times.



Triceps Stretch: With elbow of involved arm bent and raised, grasp elbow and gently pull involved arm down behind head with uninvolved hand. Hold 5 - 7 seconds and relax. Repeat 5 - 10 times.



Biceps/Chest: Stand and grasp a door frame with both arms at shoulder level. Slowly lean away from door, stretching chest and shoulder muscles. Hold 5 - 7 seconds and relax. Repeat 5 - 10 times.

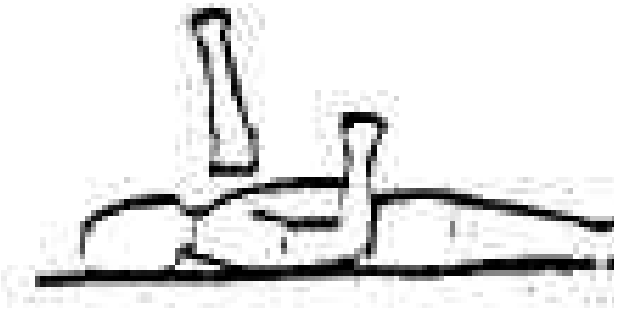


Internal Rotation: While standing with shoulder abducted to 90°, place T-bar or broom stick behind upper arm and grasp lower bar with involved hand. With uninvolved hand slowly and gently pull upper bar down, forcing involved arm

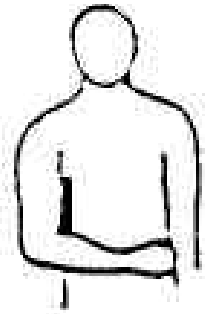
back and up. Hold 5 - 7 seconds and relax. Repeat 5 – 10 times.

External Rotation: Sit on a bench with foot propped on seat so that when patient rest elbow on the knee the upper arm remains parallel to the floor with a dumbbell. Slowly rotate upper arm in an arc towards the midline of the body until forearm is parallel to floor.

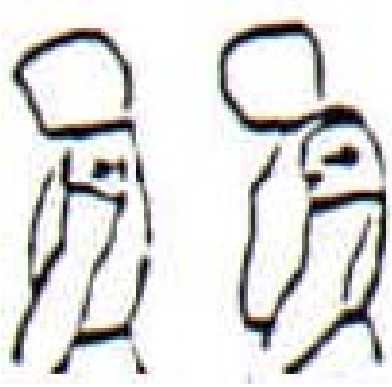
Supine Press: Lie on back with elbows next to chest and flexed to 90°. Slowly raise and extend arm straight upward. Hold, and then slowly return to start. Repeat as directed.



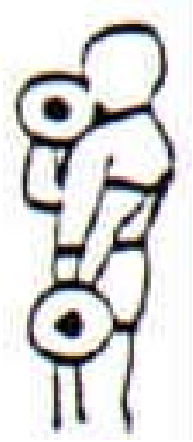
Towel Squeeze: Fold a towel into eighths and place between chest and involved elbow. Slowly squeeze arm against towel and chest with forearm crossing in front of body at 45° angle. Hold isometric contraction for 5 - 10 seconds and relax.
Repeat as directed.



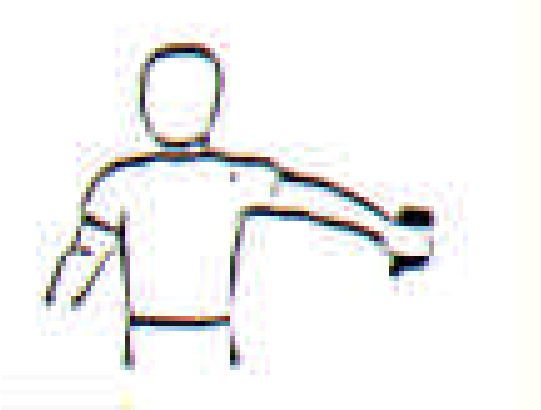
Shrugs: Standing with arms at sides. Lift shoulders up toward ears and hold, then pull shoulders back, pinching shoulder blades together. Hold and relax. Repeat as directed.



Biceps Curls: With arm straight and at side with palm facing forward, slowly flex elbow bringing hand up toward shoulder as far as possible. Hold, and then slowly relax to beginning position. Repeat as directed.



Supraspinatus (Empty Can): Stand with elbow straight and arm rotated inward with thumb pointing down. Raise hand to eye level at 30° angle to body. Do not allow the hand to go above eye level! Hold, and then slowly lower to start and repeat as directed.

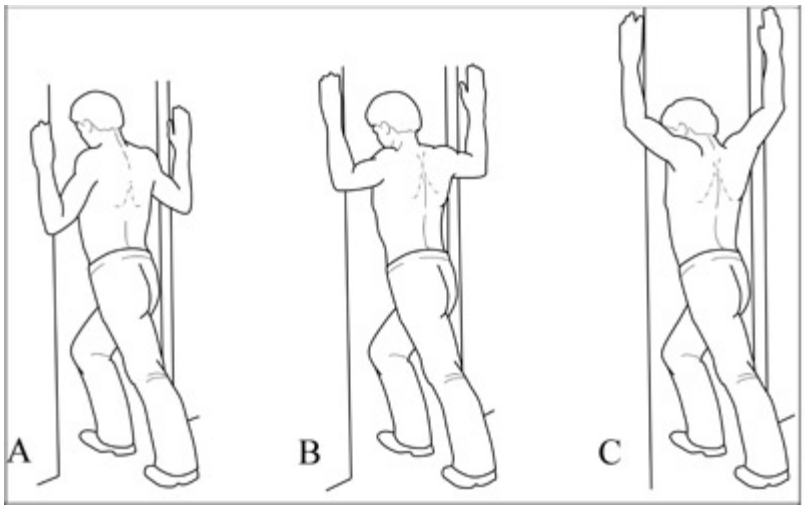


STRETCHING EXERCISES

Door Jamb Chest Stretch: Extend the arm out from the torso at a right angle, and bend the elbow 90 degrees. Place the forearm against a wall (or do both at the same time, in a door jamb) and lean forward. Patient can even stagger the stance with one foot forward, if it feels more comfortable. Hold the stretch on each side for about 20-30 seconds.

Hug a Tree Stretch: The patient is made to grasp both hands around a sturdy vertical surface or rod and, with feet about a foot away. Ask patient to bend at the hips, butt back, until arms are straight, and allow the head to relax between the elbows. If hamstrings are also tight then they might feel a good stretch in the back of the legs. Hold the stretch for about 20 – 30 seconds.

Doorway stretch: Stand in a doorway with one foot straddling the threshold and place the hands on the door jamb, elbows at the side. Shift the weight onto the forward foot until feel a pull in the shoulder and chest. Hold stretch for 30 seconds, release the pressure, and then repeat 10 times. Repeat in these three positions 1) elbows at the waist, 2) upper arms parallel to the floor, 3) reaching as high as the client can. If patients range is restricted by joint tension or pain, go as high as possible, increasing the range as the patient is able.



Back of the shoulder stretch: With the arm straight and the shoulder down, raise the arm and bring it across the body as far as the patient can. Continue to actively stretch by assisting with the opposite arm to bring the stretching arm closer to the chest. Exhale and stretch for two seconds. Release the arm to the side. Repeat 10 times on each side.

Stretching the lats: Raise the arm behind the head with the palm facing forward as if the patient about to touch the ear. Pull on the arm with the opposite hand on the elbow (or holding the wrist if the range is restricted). Exhale and actively stretch for two seconds. Release and repeat 10 times on each side. Patients with acute pain from impingement or bursitis may not be able to do this at first.

Triceps stretch: Bend the elbow and place the hand on the shoulder. Raise the elbow so it points upward, keeping the arm close to the face. Assist the stretch with the opposite hand, either pulling the elbow back from over the head, or pushing it up if the range is restricted. Exhale and actively stretch for two seconds. Release the pressure. Repeat 10 times on each side.

Biceps stretch: Clasp the hands behind the back. Keeping the arms as straight as possible, raise the hands upward. Exhale and actively stretch for two seconds. Release the pressure and repeat 10 times.

Post test –

After eight weeks of treatment sessions, pain and functional disability was measured using SPADI.

After the completion of all treatment sessions, regarding home programme patients are educated and advised to follow the exercises and tips for shoulder impingement syndrome by which they can benefit a lot in future.

Statistical method:

The statistical method used in this study for evaluating the data is paired‘t’ test.

Paired‘t’ test was used to analyze the significant differences between the pre test and post test values.

Software Used : Corel Draw

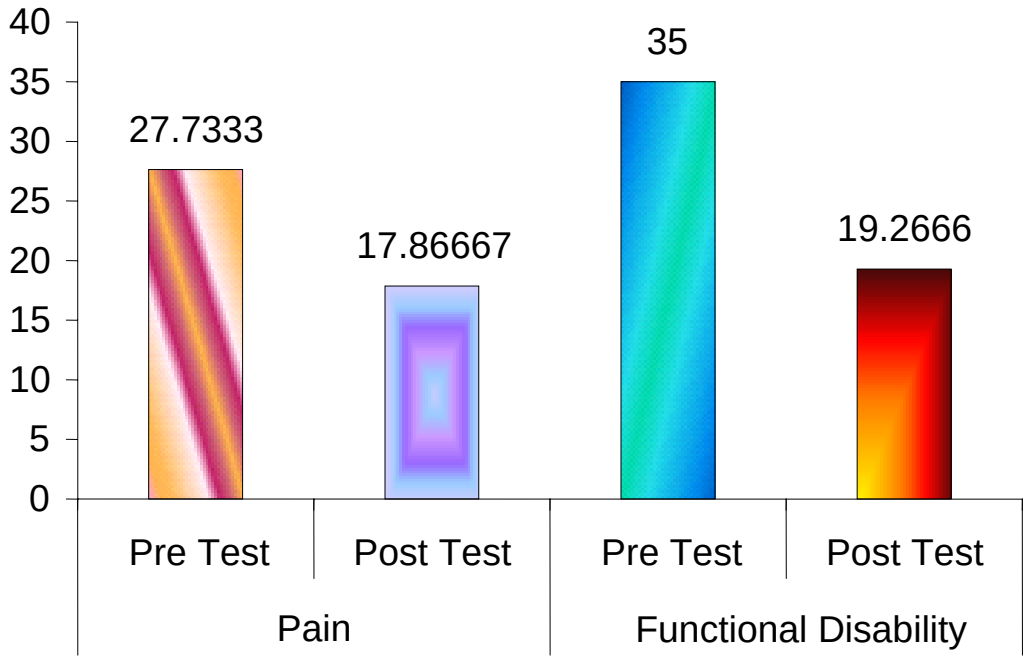
Table – I: showing paired 'T' test of pain and functional disability in shoulder impingement syndrome using SPADI

		Mean	Mean Difference	SD	't' Value	'p' Value
Pain	Pre Test	27.7333	9.86663	5.990	5.946	<0.0001
	Post Test	17.86667				
Functional Disability	Pre Test	35	15.7333	10.2644	5.933	<0.0001
	Post Test	19.2666				

The results show that:

There was a significant decrease in pain level in shoulder ($p < 0.0001$) when compared between pre test and post test.

There was a significant decrease in functional disability of shoulder ($p < 0.0001$) when compared between pre test and post test.



Graph 1: Bar Diagram showing comparison of Pre and Post Test of pain & functional disability using SPADI

DISCUSSION

The objective of this study was to find out the effectiveness of stretching and strengthening exercises in shoulder impingement syndrome. For this study fifteen patients with the history and examination results of unilateral shoulder impingement syndrome were selected by simple random method and studied for eight weeks by giving stretching and strengthening exercises, before the commencement of each therapy session mild warm up was given. Both the sexes were selected and included in a single group.

Kathry Roach et al Nov 2005 conducted a study to prove characteristics of SPADI scale. Test retest reliability of SPADI total score ranged from 0.6377 to 0.6552. Test retest reliability of SPADI showed internal consistency of range was from 0.8604 to 0.9507, the SPADI scores and changes in shoulder range of motion showed high negative correlation. So the SPADI proved to be useful.

In this study the pain and functional disability in pretest and post test was evaluated using paired 't' test, by stretching and strengthening exercises in shoulder impingement syndrome.

The calculated 't' value for pain is $p < 0.0001$ shows a significant decrease in pain in the shoulder, when compared between pre and post test.

The calculated 't' value for functional disability is $p < 0.0001$also showed a significant improvement in the shoulder functional ability, when compared between pre and post test.

In the present study stretching and strengthening exercises have been used to reduce the pain and improve the functional ability in shoulder impingement patients.

Results showed a significant reduction in pain and improvement in functional ability. The aim of the present study was also to strengthen the musculature of the rotator cuff, thereby promoting stability in shoulder joint. Thus stretching and strengthening exercises have been proved to be effective in reducing pain and improving the functional ability of shoulder.

LIMITATIONS

- The selection criteria are more specific, the patients who are not eligible cannot be benefited by this programme.

- Since the sample size is small the results could not be generalized to a larger group.

- Gender specific results are not obtained, as both the genders are included in a single group.

RECOMMENDATIONS

- The result of this study will serve as an evidence to treat patients with Shoulder Impingement Syndrome using stretching and strengthening exercises.

- This study will serve as a reference to further studies in this topic.

- Further research is recommended in a larger sample group.

CONCLUSION

- The result of this study will serve as an evidence to treat patients with Shoulder Impingement Syndrome using stretching and strengthening exercises.

- The results of this study suggest that stretching and strengthening exercises used in treating shoulder impingement syndrome is effective.

- The findingings suggest a relatively simple exercise program of stretching and strengthening of the shoulder joint along with the patient education was effective.

- This simple exercise protocol used in our study may have a positive impact on patient's pain and functional disability.

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Raw Data Analysis and Interpretation

Comparison of pre and post test values of pain using SPADI

S. No.	Pre-test	Post-test	d	$[d - \bar{d}]$	$[d-\bar{d}]^2$
1	26	10	16	6.8	46.24
2	17	8	9	.2	0.04
3	27	13	14	4.8	23.04
4	11	8	3	6.2	38.44
5	32	26	4	5.2	27.04
6	13	6	7	2.2	4.84
7	35	29	6	3.2	10.24
8	25	20	5	4.2	17.64
9	40	21	19	9.8	96.04
10	10	4	6	3.2	10.24
11	41	22	19	9.8	96.04
12	36	20	16	6.8	46.24
13	37	29	8	1.2	1.44
14	46	33	5	4.2	17.64
15	20	19	1	8.2	67.24
				$\frac{138}{15} = 9.2$	502.4

$$\sqrt{\frac{\Sigma[d - \bar{d}]^2}{n - 1}} = \sqrt{\frac{502.\bar{4}}{14}} = \sqrt{35.885714}$$

$$SD = 5.990$$

$$t = \frac{\bar{d}}{\left[\frac{SD}{\sqrt{n}}\right]}$$

$$= \frac{9.2}{\left[\frac{5.990}{\sqrt{15}}\right]}$$

$$= \frac{9.2}{\frac{5.990}{3.872}}$$

$$= \frac{9.2}{1.5470041}$$

$$t = 5.9469784$$

Value

Pre Mean $= \frac{416}{15} = 27.7333$

Post Mean $= \frac{268}{15} = 17.86667$

Mean Difference $= 9.8666333$

$SD = 5.990$

$t = 5.9469784$

Comparison of pre and post test values of functional disability using SPADI
Total Score - 90

S. No.	Pre-test	Post-test	d	$[d - \bar{d}]$	$[d-\bar{d}]^2$
1	26	14	12	3.7	13.69
2	16	8	8	7.7	59.29
3	35	16	19	3.27	10.6929
4	6	6	0	15.73	247.4329
5	52	32	20	4.27	18.2329
6	22	13	9	6.73	45.2929
7	46	31	15	.73	0.5329
8	37	22	15	.73	0.5329
9	49	29	20	4.27	18.2329
10	7	4	3	12.73	162.0529
11	60	21	39	23.27	541.4929
12	43	18	25	9.3	86.49
13	51	38	13	2.7	7.29
14	51	21	30	14.3	204.49
15	24	16	8	7.7	59.29
				$\frac{236}{15} = 15.73$	1475.0352

$$\sqrt{\frac{\Sigma[d - \bar{d}]^2}{n - 1}} = \sqrt{\frac{1475.0352}{14}} = \sqrt{105.35}$$

$$SD = 10.264485$$

$$t = \frac{\bar{d}}{\left[\frac{SD}{\sqrt{n}}\right]}$$

$$= \frac{15.73}{\left[\frac{10.2644}{\sqrt{15}}\right]}$$

$$= \frac{15.73}{\frac{10.2644}{3.872}}$$

$$= \frac{15.73}{2.6509}$$

$$= 5.9338338$$

$$\text{Pre Mean} = \frac{525}{15} = 35$$

$$\text{Post Mean} = \frac{289}{15} = 19.2666$$

$$\text{Mean Difference} = 15.7333$$

$$SD = 10.264485$$

$$t = 5.933$$

Freedom of consent

Your permission to perform the exercises &tests are strictly voluntary. You are free to deny consent if you desire.

Declaration

I have read and understood the conditions and risks above &I consent/assent to voluntarily participate in this research study.

I realize I am free to withdraw my consent and to withdraw from this study at any time without negative consequences.

_____ _____

Signature of witness Signature of Participant

Date: _____

Revocation of consent

I hereby wish to withdraw my consent to participate in the research proposal described above.

_____

Date: _____ Signature of Participant

CHERRAAN'S COLLEGE OF PHYSIOTHERAPY

Affiliated to The Tamilnadu Dr M.G.R. Medical University, Chennai - 32 &
Approved by The Govt. of TamilNadu and Indian Association of Physiotherapists, New Delhi.

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CIHS/CCPT/OPD/2012 **Date : 10.01.2012**

TO WHOM IT MAY CONCERN

This is to certify that **Ms Samina.M** final year MPT student has carried out her research entitled "Effectiveness of stretching and strengthening in shoulder impingement syndrome" in the out patient department of our college.

Head of the department

PRINCIPAL
Cherraan's College of Physiotherapy
Coimbatore - 641 039

SHOULDER PAIN AND DISABILITY INDEX (SPADI)

Patient Name _____ Date _____

Please read carefully:

Instructions: Please circle the number that best describes the question being asked.

Pain scale:

No pain at all	0	1	2	3	4	5	6	7	8	9	10 Worst pain Imaginable

How severe is your pain?

1. At its worst?
   0 1 2 3 4 5 6 7 8 9 10
2. When lying on the involved side?
   0 1 2 3 4 5 6 7 8 9 10
3. Reaching for something on a high shelf?
   0 1 2 3 4 5 6 7 8 9 10
4. Touching the back of your neck?
   0 1 2 3 4 5 6 7 8 9 10
5. Pushing with the involved arm?
   0 1 2 3 4 5 6 7 8 9 10

Disability scale:

No difficulty	0	1	2	3	4	5	6	7	8	9	10 So difficult it requires help

How much difficulty do you have?

1. Washing your hair?
   0 1 2 3 4 5 6 7 8 9 10
2. Washing your back?
   0 1 2 3 4 5 6 7 8 9 10
3. Putting on an undershirt or pullover sweater?
   0 1 2 3 4 5 6 7 8 9 10
4. Putting on a shirt that buttons down the front?
   0 1 2 3 4 5 6 7 8 9 10
5. Putting on your pants?
   0 1 2 3 4 5 6 7 8 9 10
6. Placing an object on a high shelf?
   0 1 2 3 4 5 6 7 8 9 10
7. Carrying a heavy object of 10 pounds?
   0 1 2 3 4 5 6 7 8 9 10
8. Removing something from your back pocket?
   0 1 2 3 4 5 6 7 8 9 10

OTHER COMMENTS: _____

Examiner: _____

With permission from: Williams JW Jr., Holleman DR Jr., Simel DL: Measuring shoulder function with the Shoulder Pain and Disability Index. *J Rheumatol* 1995; 22 (4); 727-732

Shoulder Pain: Tips and Exercises

(Shoulder Impingement Syndrome)

There are many reasons why people have shoulder pain. Shoulder Impingement Syndrome is one cause of shoulder pain. When muscles, tendons, or bursae (fluid-filled sacs) become swollen or irritated in between the bony parts of the shoulder, pain results. You may feel the pain when you move your arm or sleep on the affected shoulder. Your physical therapist or doctor may call this "rotator cuff tendinitis" or "bursitis." The rotator cuff is made up of four muscles that rotate and help raise the arm. With this condition, these muscles may become weak, and it may be difficult to lift your arm.

What Causes Shoulder Pain?

Injury:

- A fall
- Severe blow to the shoulder
- Lifting something too heavy

Chronic Strains:

- Doing overhead work for many hours or days
- Sports movements such as weight lifting or throwing that you do many times
- Keeping the arm in one position for many hours such as during computer work
- Sleeping habits such as lying on the same arm each night
- Poor posture

Remember to take regular breaks from activities you do over and over again.

Tips to Ease Your Symptoms

Apply Ice

To lessen pain and swelling, apply ice to the top and sides of your shoulder for **15** minutes, **3-4** times each day.

Sleeping Positions

- Sleep on your back or unaffected side.
- Rest your affected arm on a pillow.

Sitting Position

- Sit upright, keeping your head over your shoulders.
- Keep your shoulders back.
- Use a towel roll or lower back pillow to support your back.
- Keep your feet flat on the floor or put them up on a foot stool.
- Try not to sit or stand with your shoulders rounded forward.

Don't…

- Work with arms overhead for more than a few minutes at a time.
- Lift heavy loads.
- Reach with the palm down.
- Support yourself on the painful shoulder.
- Carry your purse, backpack, or other items over one shoulder.

Do…

- Take regular breaks from activities you do over and over again.
- Lift and carry items close to your body.
- Point thumb up when reaching for something.
- Use a foot stool or ladder to reach overhead.

Shoulder Pain: Tips and Exercises (page 2)

(Shoulder Impingement Syndrome)

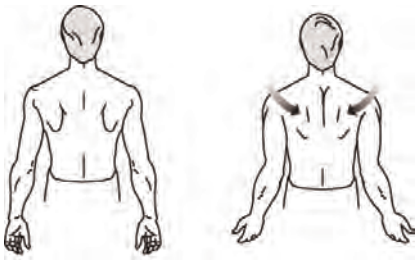
Gentle Exercises

These exercises can help you to move better and lessen your shoulder pain.

1. Shoulder Blade Setting

Start with arms relaxed at sides.

- Rotate palms forward, squeezing shoulder blades back and down.
- Hold for 2 seconds.
- Slowly return to start position.

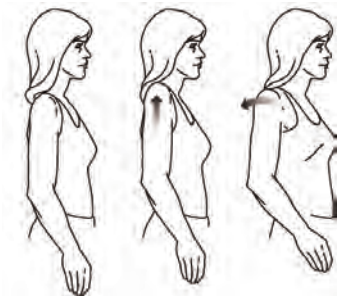


Frequency: _____

2. Shoulder Clock

Start with arms relaxed at sides. Picture the face of a clock on the side of your shoulder.

- Raise shoulders toward your ears (12 o'clock).
- Hold for 2 seconds.
- Rotate shoulders back and down (9 o'clock).
- Hold for 2 seconds.
- Slowly return to start position.



Frequency: _____

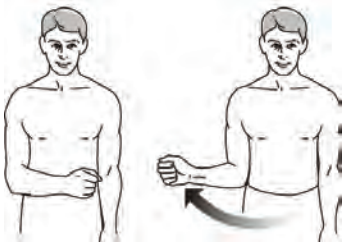
3. Pendulum

- Bend forward at the hips so that your arm hangs down freely.
- Rock your weight from the front to the back foot, allowing the arm to move in a circle, first clockwise then counter-clockwise.

Frequency: _____

4. Rotate your Arm (Standing Outward Rotation)

- Place fisted hand on stomach with the elbow bent.
- Set the shoulder blade (as in exercise #1).
- Rotate arm until fist faces forward, stopping short of pain.



Frequency: _____

5. Shoulder Stretch

- Place a towel roll high under your arm.
- Place the affected arm in front or in back of your body as instructed by your physical therapist or doctor.
- Grasp the wrist with the opposite hand.
- Gently pull the arm down and across body toward the opposite hip.
- Hold for 10 seconds.

Frequency: _____

Consult with your physical therapist or doctor if you experience an increase in your symptoms with recommended exercises, or if you develop new symptoms of numbness, tingling or a spread of the pain. This information is not intended to diagnose or to take the place of medical advice or care you receive from your physician or other health care professional. If you have persistent health problems, or if you have additional questions, please consult your doctor. If you have questions or need more information about your medication, please speak to your pharmacist. Kaiser Permanente does not endorse any brand name: any similar products may be used.

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